

R09

Code: 9ABS304

B. Tech II Year I Semester (R09) Supplementary Examinations, April/May 2013

**PROBABILITY & STATISTICS**

(Mechatronics)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions  
All questions carry equal marks

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- 1 A person writes letters to six friends and addresses the corresponding envelopes. What is the probability that the letter be placed in envelopes so that: (i) At least two of them are in the wrong envelopes. (ii) All the letters in the wrong envelopes.
- 2 Find the mean of the probability distribution of the number of heads obtained in three flips of a balanced coin.
- 3 If a Poisson variate  $2P(x = 0) = P(x = 2)$  find the probability that:
  - (i)  $P(x \leq 3)$ .      (ii)  $P(2 < x \leq 5)$ .      (iii)  $P(x \geq 3)$ .
- 4 Let  $x$  be a random variable where  $\mu_x$  is unknown and  $\sigma_x^2 = \frac{1}{4}$ . Find out how large a random sample must be taken in order that the probability will be at least 0.95 and the sample mean  $\bar{x}$  will be within 0.25 of the population mean.
- 5 (a) Explain maximum error of estimation and give its relation.  
(b) 10 bearings made by certain process have a mean diameter of 0.5060 cm with S.D. of 0.0040 cm. Assuming that the data may be taken as a random sample from a normal distribution, construct a 95% confidence interval for the actual average diameter of the bearings.
- 6 (a) A sample of 100 workers in a large plant gave a mean of assembly time of 294 sec. with a S.D. of 12 sec. in a time and motion study. Find a 95% confidence interval for the mean assembly time for all the workers in the plant.  
(b) A coin is tossed 900 times and heads appear 490 times. Does this result support the hypothesis that the coin is unbiased.  
(c) A machine produced 20 defective articles in a batch of 400. After overhauling it produced 10 defectives in a batch of 300. Has the machine improved?
- 7 Given below is the number of male births in 1000 families having five children:
 

Male children	0	1	2	3	4	5
No. of families	40	300	250	200	30	180

Test whether the given data is consistent with the hypothesis that the binomial law holds if the chance of a male birth is equal to that of a female birth.
- 8 Customers arrive at a one window drive-in bank according to a Poisson distribution with mean 10 per hrs. Service time per customer is exponential with mean 5 min. The car space in front of the window including that for the serviced can accommodate a maximum of 3 cars. Other cars can wait outside the space. (i) What is the probability that an arriving customer can drive directly to the space in front of the window?  
(ii) What is the probability that an arriving customer will have to wait outside the indicated space? (iii) How long is an arriving customer expected to wait before starting service?

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